Name: _____ Date: _____

ALGEBRA II LIVE REVIEW PROBLEMS - 2019
eMATHinstruction

POLYNOMIALS

January 2017

3 When factored completely, $m^5 + m^3 - 6m$ is equivalent to

(1) $(m + 3)(m - 2)$
(2) $(m^3 + 3m)(m^2 - 2)$
(3) $m(m^4 + m^2 - 6)$
(4) $m(m^2 + 3)(m^2 - 2)$

August 2016

6 The zeros for $f(x) = x^4 - 4x^3 - 9x^2 + 36x$ are

(1) $\{0,\pm 3,4\}$
(2) $\{0,3,4\}$
(3) $\{0,\pm 3,-4\}$
(4) $\{0,3,-4\}$

June 2016

27 Determine if $x - 5$ is a factor of $2x^3 - 4x^2 - 7x - 10$. Explain your answer.

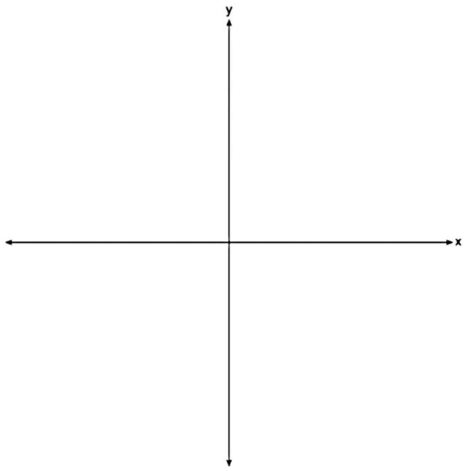
June 2018

12 If $x - 1$ is a factor of $x^3 - kx^2 + 2x$, what is the value of k?

(1) 0
(2) 2
(3) 3
(4) -3

January 2019

26 The zeros of a quartic polynomial function are 2, −2, 4, and −4. Use the zeros to construct a possible sketch of the function, on the set of axes below.



August 2016

35 Solve the equation $\sqrt{2x-7} + x = 5$ algebraically, and justify the solution set.

January 2017

33 Algebraically determine the values of h and k to correctly complete the identity stated below.

$$2x^3 - 10x^2 + 11x - 7 = (x - 4)(2x^2 + hx + 3) + k$$

RATIONAL EXPRESSIONS

June 2018

29 Determine the quotient and remainder when $(6a^3 + 11a^2 - 4a - 9)$ is divided by $(3a - 2)$.

Express your answer in the form $q(a) + \frac{r(a)}{d(a)}$.

June 2016

14 The expression $\frac{4x^3 + 5x + 10}{2x + 3}$ is equivalent to

(1) $2x^2 + 3x - 7 + \frac{31}{2x + 3}$

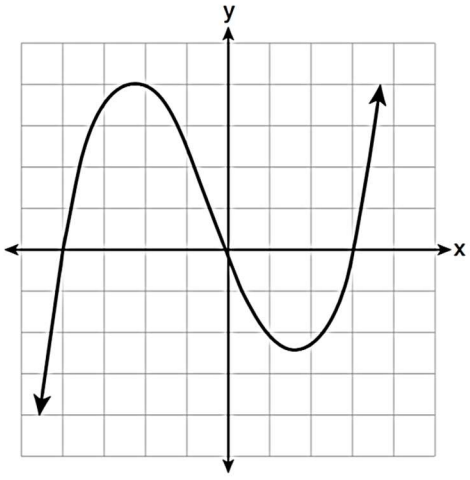
(2) $2x^2 - 3x + 7 - \frac{11}{2x + 3}$

(3) $2x^2 + 2.5x + 5 + \frac{15}{2x + 3}$

(4) $2x^2 - 2.5x - 5 - \frac{20}{2x + 3}$

August 2016

21 The graph of $p(x)$ is shown below.



What is the remainder when $p(x)$ is divided by $x + 4$?

(1) $x - 4$

(2) -4

(3) 0

(4) 4

June 2020

3 For all values of x for which the expression is defined, $\frac{x^3+2x^2-9x-18}{x^3-x^2-6x}$, in simplest form, is equivalent to

(1) 3

(2) $-\frac{17}{2}$

(3) $\frac{x+3}{x}$

(4) $\frac{x^2-9}{x(x-3)}$

June 2017

19 To solve $\frac{2x}{x-2}-\frac{11}{x}=\frac{8}{x^2-2x}$, Ren multiplied both sides by the least common denominator. Which statement is true?

(1) 2 is an extraneous solution.

(2) $\frac{7}{2}$ is an extraneous solution.

(3) 0 and 2 are extraneous solutions.

(4) This equation does not contain any extraneous solutions.

EXPONENTS AND RADICALS

August 2018

12 For $x > 0$, which expression is equivalent to $\frac{\sqrt[3]{x^2}\cdot\sqrt{x^5}}{\sqrt[6]{x}}$?

(1) x

(2) $x^{\frac{3}{2}}$

(3) x^3

(4) x^{10}

June 2018

20 For positive values of x, which expression is equivalent to $\sqrt{16x^2} \cdot x^{\frac{2}{3}} + \sqrt[3]{8x^5}$?

(1) $6\sqrt[5]{x^3}$

(2) $6\sqrt[3]{x^5}$

(3) $4\sqrt[3]{x^2} + 2\sqrt[3]{x^5}$

(4) $4\sqrt{x^3} + 2\sqrt[5]{x^3}$

EXPONENTIAL AND LOGARITHMIC FUNCTIONS

June 2018

2 Which statement is true about the graph of $f(x) = \left(\frac{1}{8}\right)^x$?

(1) The graph is always increasing.

(2) The graph is always decreasing.

(3) The graph passes through (1,0).

(4) The graph has an asymptote, $x = 0$.

June 2016

32 A house purchased 5 years ago for \$100,000 was just sold for \$135,000. Assuming exponential growth, approximate the annual growth rate, to the *nearest percent*.

January 2019

17 If $f(x) = a^x$ where $a > 1$, then the inverse of the function is

(1) $f^{-1}(x) = \log_x a$

(2) $f^{-1}(x) = a \log x$

(3) $f^{-1}(x) = \log_a x$

(4) $f^{-1}(x) = x \log a$

June 2016

18 Which statement about the graph of $c(x) = \log_6 x$ is *false*?

(1) The asymptote has equation $y = 0$.

(2) The graph has no y-intercept.

(3) The domain is the set of positive reals.

(4) The range is the set of all real numbers.

August 2016

30 The x-value of which function's x-intercept is larger, f or h? Justify your answer.

$f(x) = \log(x - 4)$

x	h(x)
−1	6
0	4
1	2
2	0
3	−2

June 2018

18 The half-life of iodine-131 is 8 days. The percent of the isotope left in the body d days after being introduced is $I = 100\left(\frac{1}{2}\right)^{\frac{d}{8}}$. When this equation is written in terms of the number e, the base of the natural logarithm, it is equivalent to $I = 100e^{kd}$. What is the approximate value of the constant, k?

(1) −0.087

(2) 0.087

(3) −11.542

(4) 11.542

June 2018

35 Carla wants to start a college fund for her daughter Lila. She puts \$63,000 into an account that grows at a rate of 2.55% per year, compounded monthly. Write a function, $C(t)$, that represents the amount of money in the account t years after the account is opened, given that no more money is deposited into or withdrawn from the account.

Calculate algebraically the number of years it will take for the account to reach \$100,000, to the *nearest hundredth of a year*.

August 2018

35 Determine, to the *nearest tenth of a year*, how long it would take an investment to double at a $3\frac{3}{4}\%$ interest rate, compounded continuously.

General Function Work

June 2018

15 What is the inverse of $f(x) = x^3 - 2$?

(1) $f^{-1}(x) = \sqrt[3]{x} + 2$

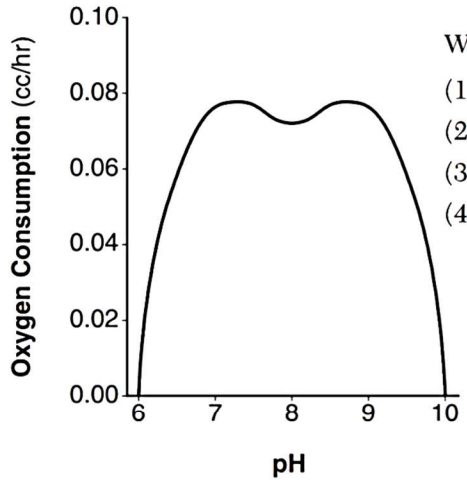
(2) $f^{-1}(x) = \pm\sqrt[3]{x} + 2$

(3) $f^{-1}(x) = \sqrt[3]{x + 2}$

(4) $f^{-1}(x) = \pm\sqrt[3]{x + 2}$

June 2016

20 There was a study done on oxygen consumption of snails as a function of pH, and the result was a degree 4 polynomial function whose graph is shown below.



Which statement about this function is *incorrect*?

(1) The degree of the polynomial is even.

(2) There is a positive leading coefficient.

(3) At two pH values, there is a relative maximum value.

(4) There are two intervals where the function is decreasing.

August 2018

27 The world population was 2560 million people in 1950 and 3040 million in 1960 and can be modeled by the function $p(t) = 2560e^{0.017185t}$, where t is time in years after 1950 and $p(t)$ is the population in millions. Determine the average rate of change of $p(t)$ in *millions of people per year*, from $4 \leq t \leq 8$. Round your answer to the *nearest hundredth*.

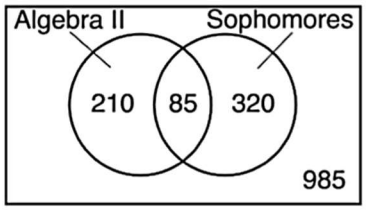
August 2017

31 Algebraically determine whether the function $j(x) = x^4 - 3x^2 - 4$ is odd, even, or neither.

PROBABILITY

August 2018

18 Data for the students enrolled in a local high school are shown in the Venn diagram below.



If a student from the high school is selected at random, what is the probability that the student is a sophomore given that the student is enrolled in Algebra II?

(1) $\frac{85}{210}$

(2) $\frac{85}{295}$

(3) $\frac{85}{405}$

(4) $\frac{85}{1600}$

June 2018

11 On a given school day, the probability that Nick oversleeps is 48% and the probability he has a pop quiz is 25%. Assuming these two events are independent, what is the probability that Nick oversleeps and has a pop quiz on the same day?

(1) 73%

(2) 36%

(3) 23%

(4) 12%

January 2017

31 The results of a survey of the student body at Central High School about television viewing preferences are shown below.

	Comedy Series	Drama Series	Reality Series	Total
Males	95	65	70	230
Females	80	70	110	260
Total	175	135	180	490

Are the events "student is a male" and "student prefers reality series" independent of each other? Justify your answer.

January 2017

35 The guidance department has reported that of the senior class, 2.3% are members of key club, K, 8.6% are enrolled in AP Physics, P, and 1.9% are in both.

Determine the probability of P given K, to the *nearest tenth of a percent*.

The principal would like a basic interpretation of these results. Write a statement relating your calculated probabilities to student enrollment in the given situation.

January 2018

34 A student is chosen at random from the student body at a given high school. The probability that the student selects Math as the favorite subject is $\frac{1}{4}$. The probability that the student chosen is a junior is $\frac{116}{459}$. If the probability that the student selected is a junior or that the student chooses Math as the favorite subject is $\frac{47}{108}$, what is the exact probability that the student selected is a junior whose favorite subject is Math?

Are the events "the student is a junior" and "the student's favorite subject is Math" independent of each other? Explain your answer.

STATISTICS

June 2018

17 The weights of bags of Graseck's Chocolate Candies are normally distributed with a mean of 4.3 ounces and a standard deviation of 0.05 ounces. What is the probability that a bag of these chocolate candies weighs less than 4.27 ounces?

(1) 0.2257
(2) 0.2743
(3) 0.7257
(4) 0.7757

August 2016

29 Elizabeth waited for 6 minutes at the drive thru at her favorite fast-food restaurant the last time she visited. She was upset about having to wait that long and notified the manager. The manager assured her that her experience was very unusual and that it would not happen again.

A study of customers commissioned by this restaurant found an approximately normal distribution of results. The mean wait time was 226 seconds and the standard deviation was 38 seconds. Given these data, and using a 95% level of confidence, was Elizabeth's wait time unusual? Justify your answer.

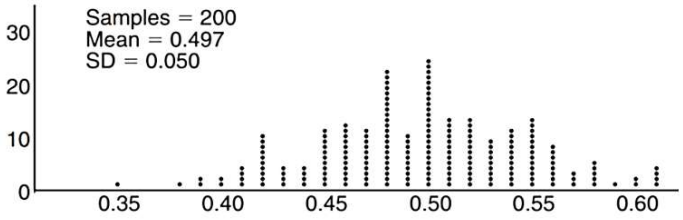
August 2018

2 A researcher randomly divides 50 bean plants into two groups. He puts one group by a window to receive natural light and the second group under artificial light. He records the growth of the plants weekly. Which data collection method is described in this situation?

(1) observational study
(2) controlled experiment
(3) survey
(4) systematic sample

January 2016

7 Anne has a coin. She does not know if it is a fair coin. She flipped the coin 100 times and obtained 73 heads and 27 tails. She ran a computer simulation of 200 samples of 100 fair coin flips. The output of the proportion of heads is shown below.



Given the results of her coin flips and of her computer simulation, which statement is most accurate?

(1) 73 of the computer's next 100 coin flips will be heads.

(2) 50 of her next 100 coin flips will be heads.

(3) Her coin is not fair.

(4) Her coin is fair.

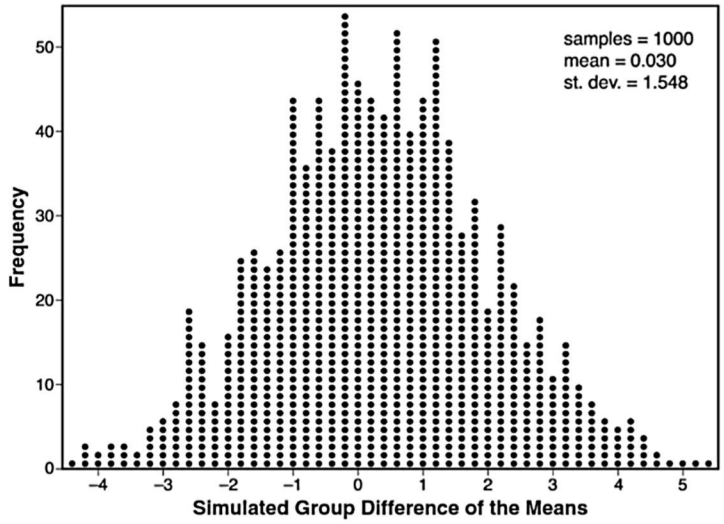
January 2018

34 Joseph was curious to determine if scent improves memory. A test was created where better memory is indicated by higher test scores. A controlled experiment was performed where one group was given the test on scented paper and the other group was given the test on unscented paper. The summary statistics from the experiment are given below.

	Scented Paper	Unscented Paper
$\bar{x}$	23	18
s_x	2.898	2.408

Calculate the difference in means in the experimental test grades (scented – unscented).

A simulation was conducted in which the subjects' scores were rerandomized into two groups 1000 times. The differences of the group means were calculated each time. The results are shown below.

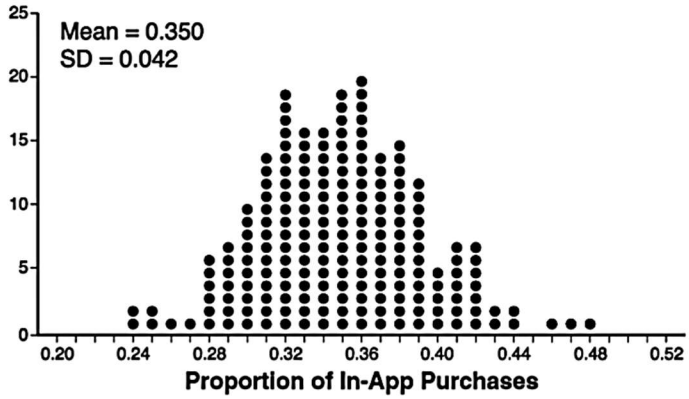


Use the simulation results to determine the interval representing the middle 95% of the difference in means, to the *nearest hundredth*.

Is the difference in means in Joseph's experiment statistically significant based on the simulation? Explain.

August 2018

32 Some smart-phone applications contain "in-app" purchases, which allow users to purchase special content within the application. A random sample of 140 users found that 35 percent made in-app purchases. A simulation was conducted with 200 samples of 140 users assuming 35 percent of the samples make in-app purchases. The approximately normal results are shown below.



Considering the middle 95% of the data, determine the margin of error, to the *nearest hundredth* for the simulated results. In the given context, explain what this value represents.

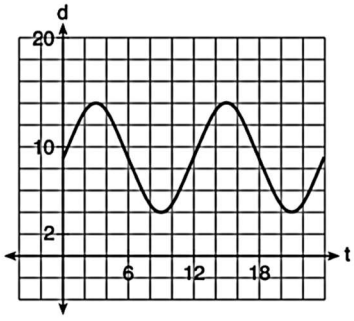
TRIGONOMETRY

June 2018

32 An angle, θ, is in standard position and its terminal side passes through the point $(2,-1)$. Find the *exact* value of $\sin\theta$.

June 2018

10 The depth of the water at a marker 20 feet from the shore in a bay is depicted in the graph below.



If the depth, d, is measured in feet and time, t, is measured in hours since midnight, what is an equation for the depth of the water at the marker?

(1) $d = 5\cos\left(\frac{\pi}{6}t\right) + 9$

(2) $d = 9\cos\left(\frac{\pi}{6}t\right) + 5$

(3) $d = 9\sin\left(\frac{\pi}{6}t\right) + 5$

(4) $d = 5\sin\left(\frac{\pi}{6}t\right) + 9$

August 2018

20 Which function's graph has a period of 8 and reaches a maximum height of 1 if at least one full period is graphed?

(1) $y = -4\cos\left(\frac{\pi}{4}x\right) - 3$

(2) $y = -4\cos\left(\frac{\pi}{4}x\right) + 5$

(3) $y = -4\cos(8x) - 3$

(4) $y = -4\cos(8x) + 5$

August 2018

22 The height above ground for a person riding a Ferris wheel after t seconds is modeled by $h(t) = 150\sin\left(\frac{\pi}{45}t + 67.5\right) + 160$ feet.

How many seconds does it take to go from the bottom of the wheel to the top of the wheel?

(1) 10

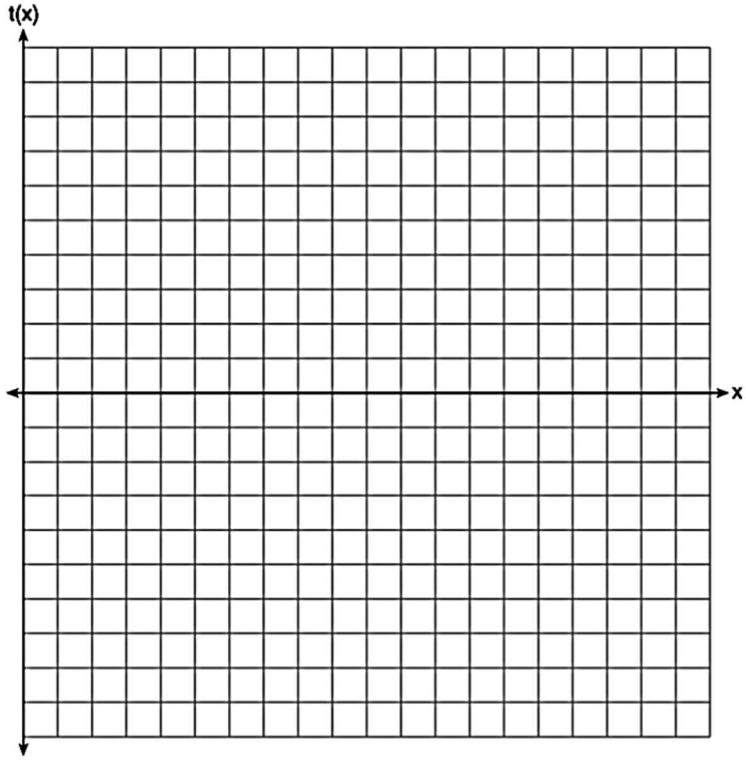
(2) 45

(3) 90

(4) 150

August 2018

30 Graph $t(x) = 3\sin(2x) + 2$ over the domain $[0,2\pi]$ on the set of axes below.

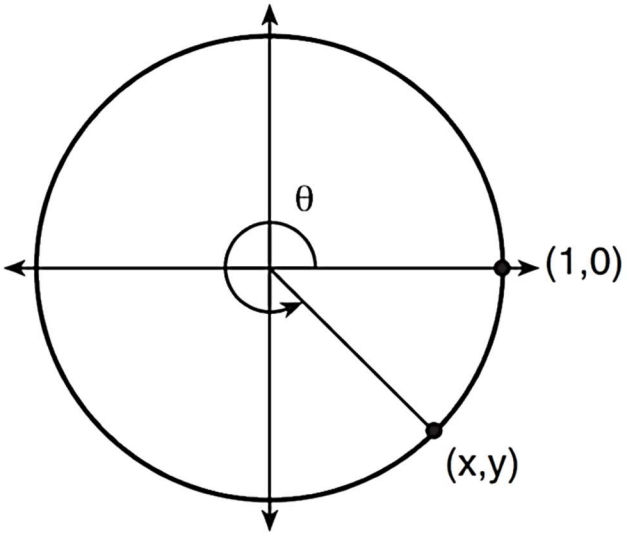


August 2016

28 Using the identity $\sin^2\theta + \cos^2\theta = 1$, find the value of $\tan\theta$, to the *nearest hundredth*, if $\cos\theta$ is -0.7 and θ is in Quadrant II.

January 2017

27 Using the unit circle below, explain why $\csc\theta = \frac{1}{y}$.



SEQUENCES AND SERIES

June 2018

30 The recursive formula to describe a sequence is shown below.

$$a_1 = 3$$
$$a_n = 1 + 2a_{n-1}$$

State the first four terms of this sequence.

Can this sequence be represented using an explicit geometric formula? Justify your answer.

August 2018

10 The average depreciation rate of a new boat is approximately 8% per year. If a new boat is purchased at a price of \$75,000, which model is a recursive formula representing the value of the boat n years after it was purchased?

(1) $a_n = 75{,}000(0.08)^n$

(2) $a_0 = 75{,}000$
$a_n = (0.92)^n$

(3) $a_n = 75{,}000(1.08)^n$

(4) $a_0 = 75{,}000$
$a_n = 0.92(a_{n-1})$

June 2016

34 Alexa earns \$33,000 in her first year of teaching and earns a 4% increase in each successive year.

Write a geometric series formula, S_n, for Alexa's total earnings over n years.

Geometric Sequence	$a_n = a_1 r^{n-1}$
Geometric Series	$S_n = \frac{a_1 - a_1 r^n}{1 - r}$ where $r \neq 1$
Radians	1 radian $= \frac{180}{\pi}$ degrees

Use this formula to find Alexa's total earnings for her first 15 years of teaching, to the *nearest cent*.

RANDOM TOPICS

Complex Numbers

June 2018

27 Solve the equation $2x^2 + 5x + 8 = 0$. Express the answer in $a + bi$ form.

January 2019

11 Which expression is equivalent to $(2x - i)^2 - (2x - i)(2x + 3i)$ where i is the imaginary unit and x is a real number?

(1) $-4 - 8xi$

(2) $-4 - 4xi$

(3) 2

(4) $8x - 4i$

Focus/Directrix Form of a Parabola

June 2016

30 The directrix of the parabola $12(y + 3) = (x - 4)^2$ has the equation $y = -6$. Find the coordinates of the focus of the parabola.

January 2019

14 Which equation represents the equation of the parabola with focus $(-3,3)$ and directrix $y = 7$?

(1) $y = \frac{1}{8}(x + 3)^2 - 5$

(2) $y = \frac{1}{8}(x - 3)^2 + 5$

(3) $y = -\frac{1}{8}(x + 3)^2 + 5$

(4) $y = -\frac{1}{8}(x - 3)^2 + 5$